Influence of Nb substituted for Fe on the microstructure and magnetic properties of Fe-based nanocomposite alloy

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Abstract: The influence of Nb substituted for Fe on the microstructure and magnetic properties including the magnetoimpedance effect of a Fe-based have been investigated. The nanocomposite structure composed of ultra-fine Fe(Si) grains embedded in an amorphous matrix was obtained by annealing the Fe-based amorphous alloy prepared by rapidly-quenched method. The measurements of thermomagnetic curves indicated that the Curie temperature of the amorphous phase of the samples decreases with increasing Nb content. The optimal heat treatment was performed at Ta = 480 ?C for 30 min and showed that the ultrasoft magnetic properties of nanocomposite materials were obtained. The magnetoimpedance (MI) of these samples has been studied in range frequency from IMHz to 5 MHz and varying a dc magnetic field within 300 Oe. The correlation between the MI effect and the soft magnetic properties is discussed. The incremental permeability ratio (PR) showed the drastic changes of soft magnetic properties as a function of annealing temperatures. ?? 2007 WILEY-VCH Verlag GmbH & Co. KGaA.

Index Keywords: Iron alloys; Magnetic properties; Microstructure; Niobium compounds; Amorphous matrix; Magnetoimpedance effects; Nanocomposite structure; Nanocomposites

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